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ABSTRACT

This course guide for a design/drafting course is one of four developed for the graphic communications area in the North Dakota senior high industrial arts education program. (Eight other guides are available for two other areas of Industrial Arts--energy/power and production.) Part 1 provides such introductory information as a definition and instructional objectives for Industrial Arts. Part 2 contains the course rationale and objectives; guidelines for implementation; taxonometric structure; course description including length, credit, prerequisites, and student competencies; suggested instructional units with required number of class periods; and 19 units. Each unit includes some or all of the following material: unit objective(s), topic outline, and selected student competencies to be developed through sample coordinated learning activities. Unit titles are Introduction and History to Drafting, Review of North Dakota Industrial Arts Curriculum Guide Level 1 for Graphic Communications Technology, Geometric Construction, Orthographic Projection, Dimensioning, Pictorials, Sections and Conventions, Auxiliary Views, Working Drawings, Charts and Graphics, Specialized Drafting, Reproduction Processes, Techniques of Design, Threads and Fasteners, Revolutions, Intersections and Developments, Technical Illustrations, Cams and Gears, and Technical Documents Control Systems. A reference list is appended. (YLB)

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NORTH DAKOTA SENIOR HIGH
INDUSTRIAL ARTS
CURRICULUM GUIDES

DESIGN / DRAFTING

(GRAPHIC COMMUNICATIONS)

INDUSTRIAL ARTS
SENIOR HIGH--LEVEL II

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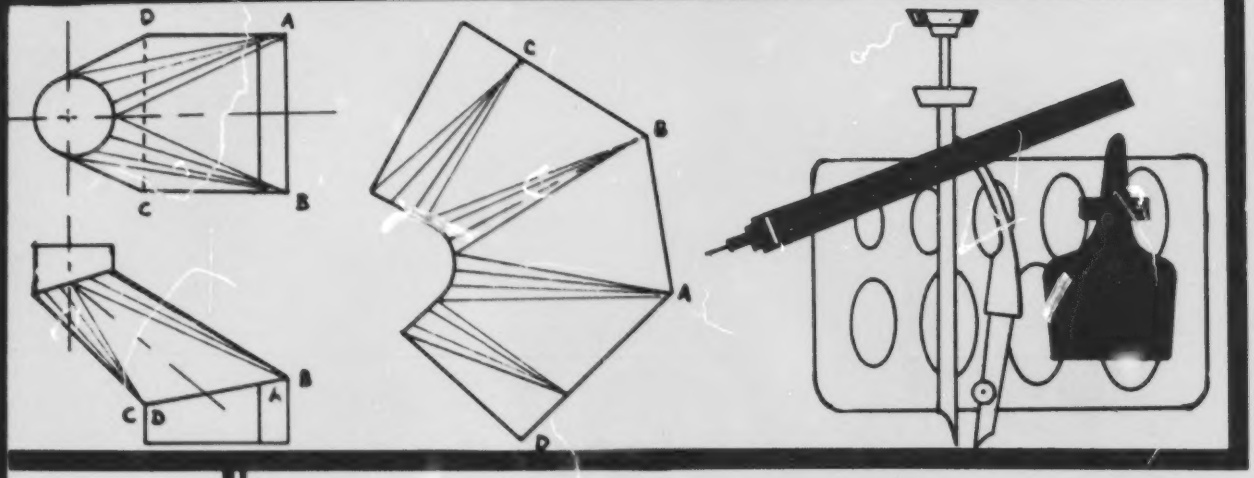

NORTH DAKOTA

NORTH DAKOTA STATE BOARD FOR
VOCATIONAL EDUCATION
Bismarck, North Dakota

CE030570

NORTH DAKOTA SENIOR HIGH INDUSTRIAL ARTS CURRICULUM GUIDES

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PREFACE

One of the biggest challenges facing education today is keeping the instructional content current. Industrial Arts in particular must be quick to respond to changes in our technological society. For many years, North Dakota has offered quality industrial arts programs to students in the public schools. Credit for this is due to the teachers who have shown the desire to continually improve programs, keep their content current, and make instruction relevant.

The Industrial Arts curriculum has boundless potential for courses and program development. However, this program possibility excites the imagination of teachers to offer endless number of courses which causes a need to determine what is of greatest value for students to experience.

Thus, the development of an appropriate or model curriculum requires a critical examination of several undergirding questions: What is the overall responsibility of Industrial Arts? What Industrial Arts goals are appropriate for the different grades or school levels? What courses constitute a meaningful curriculum for these goals to be realized? What shall be the scope and sequence of the total curriculum? The answers to these questions have been addressed by a North Dakota Industrial Arts Master Plan curriculum committee and are recorded in the North Dakota Senior High Industrial Arts Program of Studies booklet.

The Program of Studies describes the complete secondary school industrial arts education. The Program of Studies Booklet emphasizes the Level II Senior High programs with specific courses, course descriptions, objectives and units of instruction. The Junior High-Level I program is dealt with in a general basis for the purpose of articulating the two levels within the total secondary school industrial arts program.

Three types of Industrial Arts programs are included in the Program of Studies along with the individual courses which constitute the complete secondary school curriculum:

1. ORIENTATION AND EXPLORATION-- Level I program designed for grades seven through nine. The purpose of this program is to provide students with first-hand exploratory experiences in the four technical cluster areas. The learning experiences should provide an awareness of the impact of industry and it's associated technologies on the lives of individuals. Furthermore, this program assists individuals in making informed and meaningful occupational/career choices.
2. PERSONAL ENRICHMENT-- The program designed to prepare students with a general education of technolgical literacy, avocational skills and consumer information. This is purely an elective program of students for students who desire to gain an understanding of the technical concepts for personal satisfaction.
3. PRE-TECHNICAL-- This program provides concentrated and specialized technical courses for grades ten through twelve. These courses are articulated with the Level I technical cluster areas. Students at this level have a wide range of interests, abilities, and life aspirations. Therefore, the key element for the senior high pre-technical program is flexibility to meet the varied needs of learners. The program is designed to prepare students for advanced educational or training programs.

The North Dakota Senior High Program of Studies identified twelve different courses recommended to be offered in grades ten, eleven and twelve. The model curriculum lists four courses for each of three technical areas: (1) Energy/power,(2) Graphic Communications, and (3) Production. Individual course guides have been developed for each of the twelve courses recommended for the senior high curriculum. This being one of the twelve course guides. Similar guides have been developed for the remaining eleven.

Each course guide contains the course rationale, objectives, content, units and selected student competencies to be developed along with student learning activities. The primary aim of the course guides is to provide meaningful direction and still leave opportunity for individual teacher creative approaches in meeting the diverse needs of unique school populations. The course guides not only proposes to assist teachers and administrators in keeping their programs up-to-date, but also to promote industrial arts education program uniformity among North Dakota schools.

Ernest Breznay

Ernest Breznay
State Industrial Arts Supervisor
North Dakota State Board for Vocational Education
July, 1981

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ACKNOWLEDGEMENTS

The North Dakota Industrial Arts profession is indebted to the following individuals who gave their time and talents in the development of the Twelve Senior High Industrial Arts course guides. These teachers and teacher educators attended an Organizational meeting, participated in a curriculum writing seminar, and developed individual course guides during 1980 & 1981.

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BASIC BELIEFS ABOUT INDUSTRIAL ARTS

INDUSTRIAL ARTS IS .....

- *an educational discipline founded upon the knowledge base of technology - the means by which material things are produced.
- *an instructional program affording boundless opportunities for learning how technology has been, is now and will be basic to human desires and needs.
- *a fundamental educational program that can serve educational priorities, whether they are academic education, general education, vocational education, career education, ad. inf.
- *an activity based curriculum enabling students to learn through doing.
- *logically a discipline with a curriculum continuum from grade K through 12.

INDUSTRIAL ARTS IS JUSTIFIED BECAUSE .....

- *all persons need to know about the technological environment, the material culture, and industry because they are economically, socially and emotionally affected by them.
- *all persons must make a career choice from an extremely large and increasing number of occupations that are affected by technology; therefore, they should have opportunities to develop interests, uncover talents, explore technical and applied science fields and study occupations.
- *all persons must select, buy, use, and maintain the products of industry -- houses, automobiles, appliances, clothes, furniture and items of a never ending list. A knowledge of products, their manufacture, characteristics, advantages and disadvantages makes for intelligent consumption.
- *all persons need recreational, leisure time and avocational outlets.
- *all persons need to have opportunities to develop planning, creative, problem solving and technical skills in harmony with their inherent desire to seek the better way.

INDUSTRIAL ARTS CAN HELP THE STUDENT TO .....

- *gain an understanding of industry and technology.
- *discover interests and talents.
- *develop techniques in problem solving.
- *develop basic skills in the safe use of tools and machines.
- *make informed and meaningful occupational choices.
- *acquire interests in avocational pursuits and hobbies.
- *develop safe working habits.
- *apply other school subjects.
- *become a wiser consumer.
- *develop creativity.
- *develop pride in work well done.
- *work cooperatively with others.

THE INDUSTRIAL ARTS MISSION

The mission of Industrial Arts Education is to assist the student in developing an understanding about industry and technology and in the discovery and development of individual potential.

GOALS

Consistent with their abilities, interests and educational needs:

1. Industrial Arts students at the middle or junior high school level will be aware of employment and/or self-employment opportunities and requirements for use in making career choices and in determining their educational programs.
2. Industrial Arts students at the senior high school level will acquire technical competencies in preparation for advanced vocational or technical education programs.
3. Industrial Arts students at the senior high school level will acquire competencies that lead to responsible citizenship through technological understanding, consumer knowledge and the productive use of leisure time.

INDUSTRIAL ARTS: AN OFFICIAL DEFINITION

Industrial Arts education programs means those education programs which pertain to the body of related subject matter, or related courses, organized for the development of understanding about the technical, consumer, occupational, recreational, organizational, managerial, social, historical, and cultural aspects of industry and technology including learning experiences involving activities such as experimenting, designing, constructing, evaluating, and using tools, machines, materials, and processes which provide opportunities for creativity and problem solving or assist individuals in the making of informed and meaningful occupational choices or which prepare them for entry into advanced trade and industrial or technical education programs.

INDUSTRIAL ARTS INSTRUCTIONAL OBJECTIVES

Industrial Arts students at the Senior High School Level will acquire competencies that lead to responsible citizenship through technological understanding, consumer knowledge and the productive use of leisure time. The program stresses the following instructional objectives:

1. Develop an insight and understanding of industry and technology, its place in our society and the free enterprise system.
2. Discover and develop individual talents, aptitudes, interests, and potentials as related to industry and technology.
3. Develop an understanding of industrial processes and the practical application of scientific principles.
4. Develop technical problem-solving and creative abilities involving the use of materials, processes, and products of industry and technology.
5. Develop an understanding of industrial and technological career opportunities and their requirements and develop those traits which will help students obtain and maintain employment.

As determined by Title II of PL No. 94-482, the Vocational Education Act of 1976 and the State Board for Vocational Education, the purpose of funding industrial arts programs with vocational monies will be to:

1. Assist individuals in the making of informed and meaningful occupational and educational choices.
2. Prepare individuals for enrollment in advanced or highly skilled vocational and technical programs.

NORTH DAKOTA INDUSTRIAL ARTS CURRICULUM

Program Scope and Sequence Model

ELEMENTARY LEVEL
(k-6)
Awareness

At the elementary level, learning experiences in industrial arts will be directed primarily toward the child's development of an awareness of industry/technology and the world of work. The concepts and activities will be integrated with the elementary curriculum to enrich and reinforce the common learning areas.

JUNIOR HIGH LEVEL I
(7-9)
Orientation and Exploration

INSIGHTS INTO INDUSTRY & TECHNOLOGY

A broad overview of industry and technology. Learning experiences will be directed toward the student's exploration of the historical, present, and future potentials of industry and technology.

SENIOR HIGH LEVEL II
(10-12)
Personal Enrichment
Pre-Technical

GRAPHIC COMMUNICATIONS TECHNOLOGY

- DESIGN/DRAFTING
- PHOTOGRAPHY
- GRAPHIC ARTS
- CONSTRUCTION DRAFTING
- INDIVIDUAL TECHNICAL PROBLEMS

MANUFACTURING TECHNOLOGY

CONSTRUCTION TECHNOLOGY

PRODUCTION

- WOOD TECHNOLOGY
- PLASTIC TECHNOLOGY
- METAL TECHNOLOGY
- INDUSTRIAL CRAFTS
- INDIVIDUAL TECHNICAL PROBLEMS

ENERGY/POWER TECHNOLOGY

- ENERGY SOURCES
- POWER TECHNOLOGY
- ELECTRICAL / ELECTRONIC TECHNOLOGY
- TRANSPORTATION TECHNOLOGY
- INDIVIDUAL TECHNICAL PROBLEMS

THE INDUSTRIAL ARTS PROGRAM OF STUDIES

LEVEL	GOAL	PROGRAM
II HIGH SCHOOL (Grades 10, 11, & 12)	1. Personal Enrichment 2. Pre-Technical	GRAPHIC COMMUNICATIONS TECHNOLOGY *Design/Drafting *Photography *Graphic Arts *Construction Drafting *Industrial Technical Problems ENERGY/POWER TECHNOLOGY *Energy Sources *Power Technology *Electrical/Electronic Technology *Transportation Technology *Individual Technical Problems PRODUCTION TECHNOLOGY *Wood Technology *Metal Technology *Plastic Technology *Industrial Crafts *Individual Technical Problems INDIVIDUAL TECHNICAL PROBLEMS (Multiple Offerings)
I JUNIOR HIGH SCHOOL (Grades 7, 8, &9)	1. Orientation 2. Exploration	*Insights into Industry and Technology *Graphic Communications Technology *Manufacturing Technology *Construction Technology *Energy/Power Technology

PROGRAM STANDARDS FOR INDUSTRIAL ARTS

ELEMENTS OF QUALITY INDUSTRIAL ARTS PROGRAMS

The success and quality of programs in industrial arts education depends upon elements that influence the quality of programs. Industrial arts must be responsive to the following elements:

A. GOALS AND OBJECTIVES: Program goals and objectives are established that provide the inspiration and guidance in program development, operation and evaluation.

B. INSTRUCTIONAL STAFF: The instructional staff is competent and meet necessary qualifications.

C. INSTRUCTIONAL PLAN: Selected subject matter is appropriate to learner's level and consistent with curriculum and course goals and objectives.

D. STUDENT ORGANIZATIONS: The establishment and operation of effective student organizations.

E. FACILITIES AND EQUIPMENT: Instructional facilities are well-designed, located and supportive of accomplishing curricular goals. (Refer to Educational Specifications for Industrial Arts Instructional Facilities Handbook, 1978.)

F. SPECIAL NEEDS: The program must provide for disadvantaged and handicapped students.

G. ADVISORY COMMITTEES: The establishment and effective use of industrial arts advisory committees.

H. GUIDANCE: The teacher's role in guidance.

I. ADMINISTRATION: Administration of the industrial arts program.

J. EVALUATION: Evaluation procedures are planned and implemented to assure continual program improvement.

NOTE: For further information on program standards, refer to the NORTH DAKOTA VOCATIONAL/TECHNICAL EDUCATION PROGRAM STANDARDS, Section 11.1 to 11.7.

INDUSTRIAL ARTS COURSE CODE NUMBERS
(Vocationally Funded)

Insights Into Industry and Technology	10001
Construction Technology	10011
Manufacturing Technology	10021
Wood Technology	10023
Metal Technology	10026
Plastic Technology	10029
Energy and Power Technology	10031
Electrical/Electronic Technology	10033
Energy Sources	10038
Power Technology	10039
Graphic Communications Technology	10051
Graphic Arts	10052
Design/Drafting	10053
Photography	10054
Construction Drafting	10056
Transportation	10061
Industrial Crafts	10080
Individual Technical Problems	10091
Individual Technical Problems	10092

PART II:

DESIGN / DRAFTING COURSE GUIDE

(# 10053)

DESIGN / DRAFTING

Rationale:

A study of design/drafting, within graphic communications, provides an opportunity for a concentrated and specialized study of drafting in industry. An atmosphere is provided for all students to develop pre-technical skills and knowledge into the economic, social, and technological aspects of visual communications in a changing society.

Design/drafting involves students in meaningful instructional activities and develops self-direction, continuous learning and creativity.

Course Objectives:

(1) This course will provide the student with the opportunity to construct technical drawings using freehand and instrument processes and techniques.

(2) This course will provide the student with the opportunity to develop problem solving and creative abilities related to design/drafting.

(3) This course will provide the student the opportunity to assess careers in design/drafting.

Guidelines For Implementation

Success in the classroom or laboratory depends on many factors. Foremost among these is the planning effort on the part of the teacher. Educational programs must be flexible and adaptable. They must be flexible enough to remain adaptable to all locales, in numerous types of facilities, and with students possessing differing values and interest. Therefore, a successful program must be capable of application in both small and large schools.

The industrial arts program recommended by these course guides are designed to meet individual student needs. They provide teachers with guidelines for a well balanced program with suggested teacher options in each of the three major technical study areas: (1) Graphic Communications; (2) Energy/Power; and (3) Production. The North Dakota secondary school industrial arts program suggests three levels of learning with an alternative curriculum approach at the Level II for those schools that cannot offer specific courses identified for each of the three technical study areas due to the size of enrollments or other limiting factors.

The recommended scope and sequence of course offerings for the graphic communications technical study area is illustrated on the sample program model on page 13. The Level I course serves as an orientation and exploratory learning experience and is recommended as a prerequisite to the four specific courses listed at Level II. The senior high Level II courses provide concentrated and indepth exploratory experiences in the four major components involved in Graphic Communications: (1) Design/Drafting; (2) Graphic Arts; (3) Construction Drafting; and (4) Photography. Since students at this level display a wide range of interests, abilities, and life goals, the industrial arts program must provide a variety of learning and course options to meet individual student needs. To meet the varied student needs, it is recommended that the specific course options be made available to students when possible. For the smaller and mid-sized schools, it may not be feasible to offer all four of the specific courses identified in Level II. If that should be the case, it is recommended that one or two of the courses be offered and an ITP (Individual Technical Problems) course be offered as a Level II alternative. (See ITP Course specifications on page 14.) This course is designed to provide multiple learning experiences in graphic communications to meet individual needs.

The Level III ITP Course (Code #10092) is suggested for students in larger programs who have had the Level II indepth exploratory courses in graphic communications and desire to study a specialized aspect related to design/drafting, graphic arts, construction drafting, and/or photography. (See pages 15 and 16 for specific Level III ITP Course specifications and technical problem options).

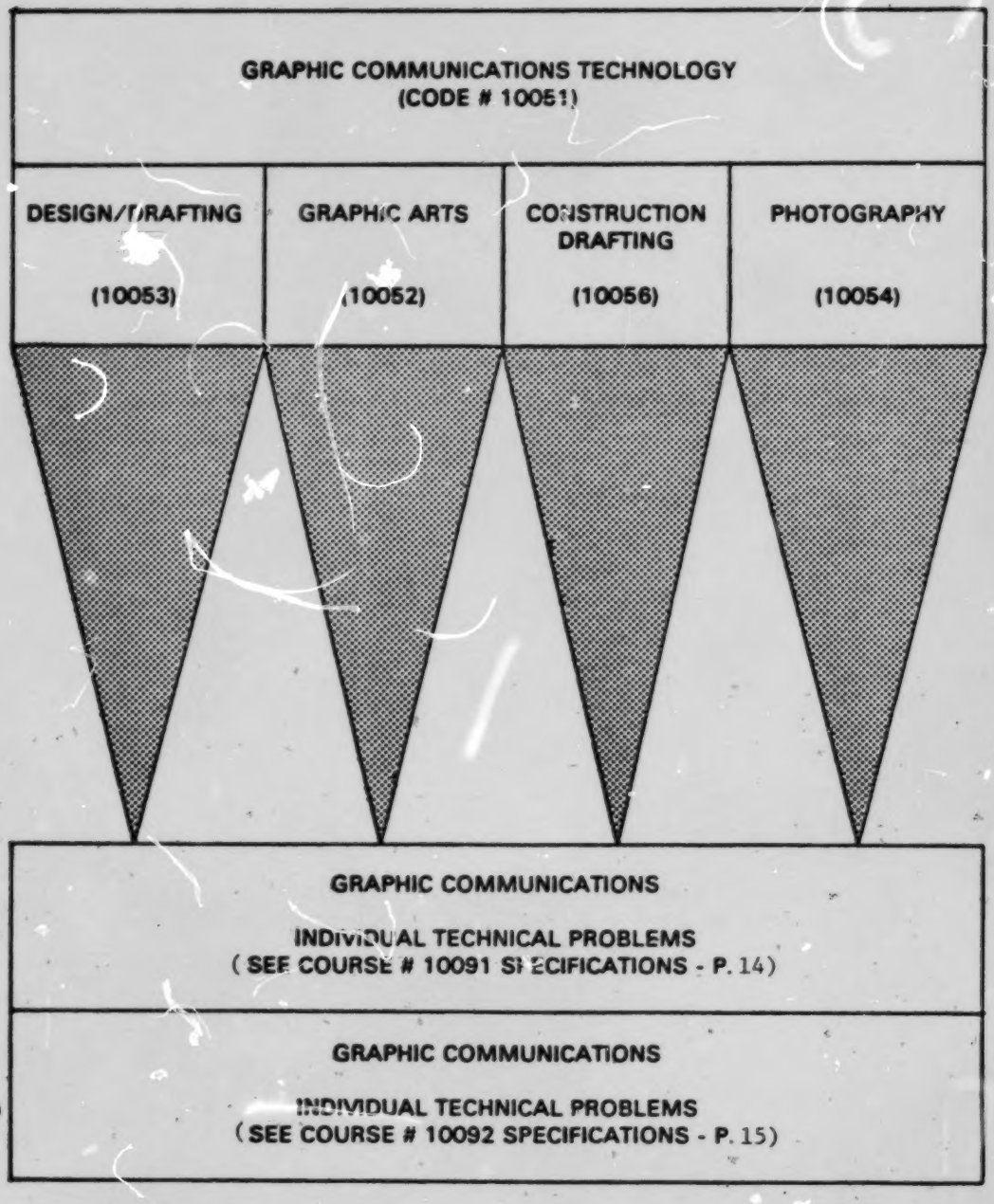
Guidelines For Implementing the Design / Drafting Course

This Instructional Guide is designed to assist teachers, supervisors, administrators, and teacher-educators as they organize an industrial arts course in design/drafting within graphic communications in the State of North Dakota.

This guide will provide the instructor with suggested procedures, learning activities, and course resources to assist in setting up a program, which corresponds to the students needs. It is a fact, the school day is limited in time and it is difficult to locate and acquire the vast amount of available materials. However, the instructor in this field will choose those concepts most applicable to his or her school.

As the instructor, responsible for implementing the content of this guide, he or she should notice that the design/drafting course is designed for either 18 or 36 weeks. The content of the 18 week course is identified by the suggested instructional units preceeded by an asterisk. It is recommended that the student acquires graphic communications, Level I as a prerequisite to this course.

Texts indicated in this guide, are used only as examples. The instructor may select the text which ia applicable to his or her needs.



Sample Program Model

INDIVIDUAL TECHNICAL PROBLEMS

COURSE CODE: 10091

This individual technical problem course is designed for students who have not had the opportunity to enroll in specific Level II subject matter courses in the Graphic Communications Technology cluster area. The course is designed to provide a means for meeting individual student needs through the offering of multiple activities in a number of technical areas in schools where separate courses are not available.

INDUSTRIAL ARTS PURPOSE

Personal Enrichment

Pre-Technical

GRADE LEVEL

11 - 12

COURSE LENGTH

One period per day

18 or 36 weeks

UNIT OF CREDIT

½ or 1 unit

RECOMMENDED PREREQUISITES

Level I Curriculum Courses

SELECTED STUDENT COMPETENCIES

NOTE: Individual student competencies and learning experiences are to be identified and developed on a contractual basis by the student and approved by the instructor for each problem.

SAMPLE LEARNING TOPICS

NOTE: Learning topics for the ITP are to be selected from the instructional units identified for each specific subject matter course. These courses include:

GRAPHIC COMMUNICATIONS:

-- Design/Drafting, 10053
-- Photography, 10054
-- Graphic Arts, 10052
-- Construction Drafting, 10056

INDIVIDUAL TECHNICAL PROBLEMS: GRAPHIC COMMUNICATIONS

COURSE CODE 10092

This individual technical problem course is designed for students who have had the Level II preliminary courses of this cluster in the chosen area of study and intend to study specific advanced information and techniques in design/drafting, photography, graphic arts, and/or construction drafting.

INDUSTRIAL ARTS PURPOSE

Personal Enrichment

Pre-Technical

GRADE LEVEL

11 - 12

COURSE LENGTH

One period per day

18 or 36 weeks

UNIT OF CREDIT

½ or 1 unit

RECOMMENDED PREREQUISITES

See Course Description

Instruction in this industrial arts course is open to meet students needs. The following suggested objectives are meant to provide ideas for developing the student's program.

1. To prepare for seeking advanced education in the area of graphic communications.
2. To provide students the experiences in problem-solving, research and development with regard to any specific chosen means in graphic communications.
3. To provide students information regarding industrial materials, processes and the practical applications of scientific principles.
4. To provide students an understanding of industry, its place in society, and the free enterprise system.
5. To provide students an understanding in related career opportunities in graphic communications.

10092
COURSE CODE

INDIVIDUAL TECHNICAL PROBLEMS: GRAPHIC COMMUNICATIONS

SAMPLE LEARNING TOPICS

DESIGN/DRAFTING:
Design/drafting as pertains to:

I. Aerospace Engineering
II. Civil Engineering
III. Electrical/Electronic Engineering
IV. Geological Enginering
V. Mechanical Engineering
VI. Marine Engineering
VII. Nuclear Engineering
VIII. Production Industry

PHOTOGRAPHY:

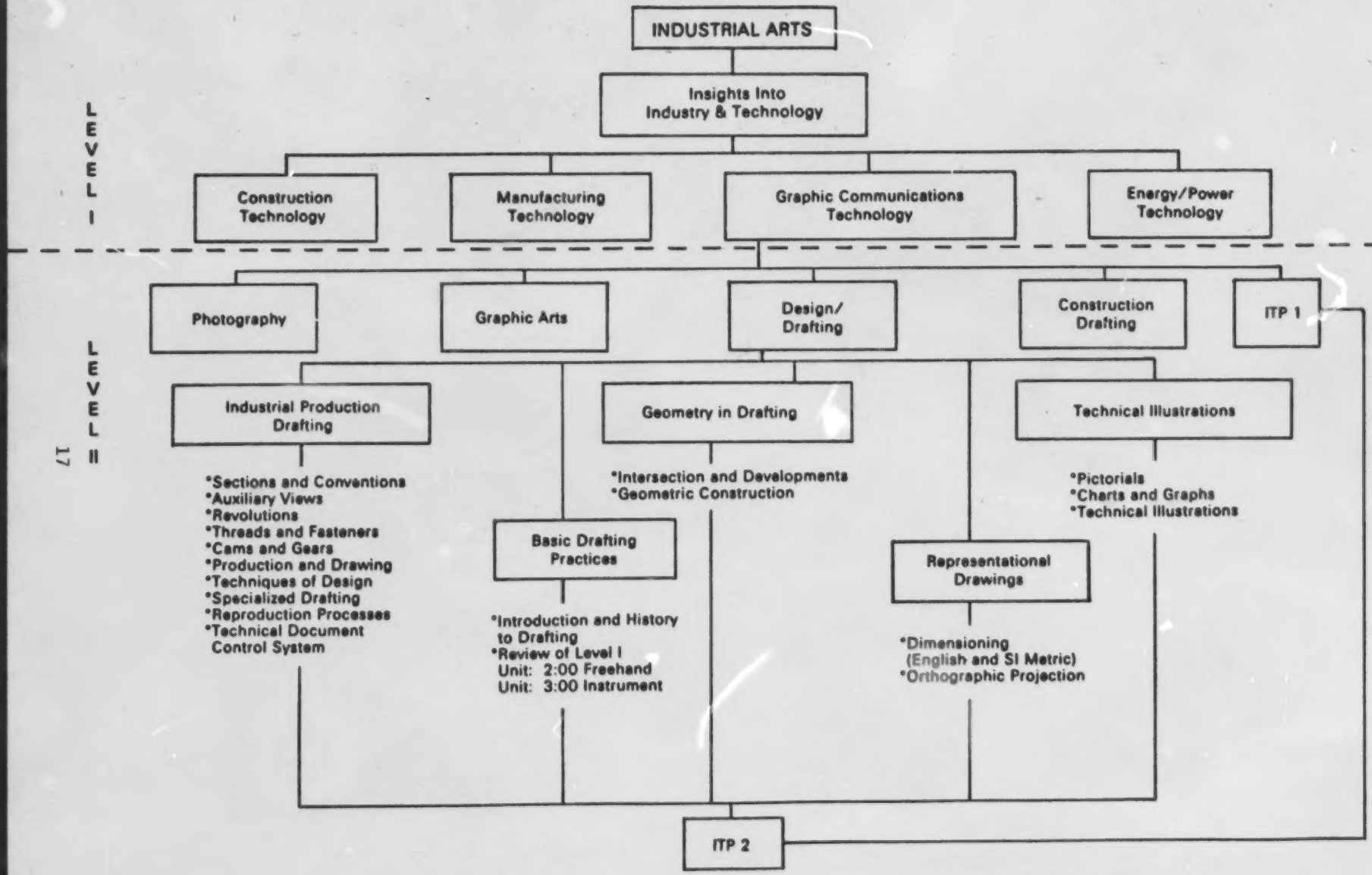
I. Photography Education
II. Basic Sensitometry
III. Characteristics and Applications of Various Photographic Materials
IV. Basic Scientific Photography
V. Portrait Photography
VI. Color Theory and Color Photography
VII. Safety and Health Hazards with Photographic Chemicals
VIII. Career Opportunities in Photography Related Industry

GRAPHIC ARTS:

I. Photo-Offset Process
II. Advanced Screen Printing Techniques
III. Color Separation and Reproduction
IV. Reproduction Techniques for Audio-Visual Materials
V. Modern Image Generation Methods
VI. Special Effect Reproduction
VII. Advanced Layout and Design
VIII. Market and Cost Analysis

CONSTRUCTION DRAFTING:

I. Advanced Construction Drafting Education
II. Planning and Design Considerations
III. Resource Materials for Construction Drafting
IV. Color Illustrations and Presentation Drawings
V. Architectural Model Making
VI. Landscaping Design
VII. Interior Design


INDUSTRIAL ARTS
Insights Into Industry & Technology
LEVEL I
Construction Technology
Manufacturing Technology
Graphic Communications Technology
Energy/Power Technology
LEVEL II
Photography
Graphic Arts
Design/ Drafting
Construction Drafting
ITP 1
Industrial Production Drafting
Geometry in Drafting
Technical Illustrations
•Sections and Conventions
•Auxiliary Views
•Revolutions
•Threads and Fasteners
•Cams and Gears
•Production and Drawing
•Techniques of Design
•Specialized Drafting
•Reproduction Processes
•Technical Document Control System
Basic Drafting Practices
•Intersection and Developments
•Geometric Construction
•Pictorials
•Charts and Graphs
•Technical Illustrations
Representational Drawings
•Introduction and History to Drafting
•Review of Level I
Unit: 2:00 Freehand
Unit: 3:00 Instrument
•Dimensioning (English and SI Metric)
•Orthographic Projection
ITP 2

DESIGN/DRAFTING

COURSE CODE: 10053

This design/drafting course provides students the opportunity to experience the language of industry and technology. Students gain a background of skills and understandings in the broad scope of design/drafting.

INDUSTRIAL ARTS PURPOSE

Personal Enrichment

Pre-Technical

GRADE LEVEL

10 - 12

COURSE LENGTH

One period per day

18 or 36 weeks

UNIT OF CREDIT

½ or 1 unit

RECOMMENDED PREREQUISITES

Graphic Communications Technology, 10051

SELECTED STUDENT COMPETENCIES

Experiences and activities of this industrial arts course should enable the student to:

1. Narrate the contributions which design/drafting make in the development, manufacture or construction of products.
2. Determine the value and advantages of various types of drawing equipment pertinent to drafting.
3. Practice efficient and safe use of equipment and materials commonly used in design/drafting related to occupations.
4. Read and interpret multi-view, pictorial and schematic drawings.
5. Prepare multi-view, pictorial and schematic drawings through the use of instruments utilizing the proper drawing methods and conventions.
6. Evaluate the quality of current working drawing from tracing to final presentations.
7. Utilize resource and reference materials essential to major design/drafting areas.
8. Evaluate positive and negative aspects of various design/drafting related positions in terms of individual interest and aptitudes.
9. Narrate and apply the processes of design.
10. Recognize the principles of good design in commercial and student designed products.
11. Prepare working drawings that include details, assemblies and etc.
12. Assess current career opportunities in design/drafting fields.
13. Develop an appreciation for storage and retrieval of technical documents.

10053
Course Code

DESIGN / DRAFTING

Suggested Instructional Units

		Class Periods (18 wks)	(36 wks)
*I.	Introductions and History to Drafting	2	2
*II.	Review of North Dakota Industrial Arts Curriculum Guide Level I for Graphic Communications Technology Unit: 2.00 Freehand Unit: 3.00 Instrument	3	3
*III.	Geometric Construction	10	10
*IV.	Orthographic Projection	10	10
*V.	Dimensioning (English and SI Metric)	10	10
*VI.	Pictorials	10	15
*VII.	Sections and Conventions	10	10
*VIII.	Auxiliary Views	10	10
*IX.	Working Drawings	20	30
*X.	Charts and Graphs	3	3
XI.	Specialized Drafting		15
*XII.	Reproduction Processes	2	2
XIII.	Techniques of Design		10
XIV.	Threads and Fasteners		10
XV.	Revolutions		10
XVI.	Intersections and Developments		10
XVII.	Technical Illustrations		5
XVIII.	Cams and Gears		10
XIX.	Technical Documents Control Systems		5
	TOTAL	90	180

* Recommended units of instruction for an 18-week course.

UNIT I

Introduction and History to Drafting

OBJECTIVES:

To introduce the student to the field of drafting.

1.0.0 Historical Developments

- 1.1.0 Origins of drafting
- 1.2.0 Importance of drafting

2.0.0 Modern Concepts in Drafting

- 2.1.0 Metrics

3.0.0 Professional Classifications in Drafting

- 3.1.0 Product manufacturing drafting
- 3.2.0 Architectural drafting
- 3.3.0 Structural drafting
- 3.4.0 Tooling drafting
- 3.5.0 Electrical drafting
- 3.6.0 Piping drafting
- 3.7.0 Fluid power drafting
- 3.8.0 Map drafting
- 3.9.0 Patent drafting

4.0.0 Descriptions of Job Classifications

SELECTED STUDENT COMPETENCIES
AND SAMPLE LEARNING ACTIVITIES
FOR

Design/Drafting

UNIT I: Introductions and History to Drafting

SELECTED STUDENT COMPETENCIES	SAMPLE LEARNING ACTIVITIES
THE LEARNING ACTIVITIES SHOULD ENABLE THE STUDENT TO:	
A. Identify three professional areas of drafting.	A.1 List three of the professional areas of drafting. A.2 Have a draftsperson from one or more of the areas speak to class. A.3 Visit a drafting firm or a drafting department.
B. Differentiate the nine classified types of drawings and their functions.	B.1 Write a short report to describe the differences and uses of those nine types of drafting. B.2 Collect a sample drawing (blue print or white print) of the assigned type of drawing from a local or nearby firm.

UNIT II

Review of Level I Curriculum Guide

OBJECTIVES:

To review basic drafting principles and drafting instruments/ tools handling techniques.

1.0.0 Basic Procedures

- 1.1.0 Tools
- 1.2.0 Lines
- 1.3.0 Lettering

2.0.0 Graph Methods

3.0.0 Orthographic

4.0.0 Pictorials

- 4.1.0 Isometric
- 4.2.0 Oblique
- 4.3.0 Perspective

5.0.0 Impact on Society

- 5.1.0 Artistic
- 5.2.0 Technical
- 5.3.0 Recreational

SELECTED STUDENT COMPETENCIES AND SAMPLE LEARNING ACTIVITIES FOR

Design/Drafting

UNIT II: Review of Level I Curriculum Guide

SELECTED STUDENT COMPETENCIES	SAMPLE LEARNING ACTIVITIES
THE LEARNING ACTIVITIES SHOULD ENABLE THE STUDENT TO:	
A. Identify basic tools used in drafting.	A.1 List some of the basic drafting tools. A.2 Show examples of these tools.
B. Demonstrate the use of the basic tools used in drafting.	B.1 Complete assigned exercises using basic drafting tools.
C. Demonstrate the proper way of handling drafting machine.	C.1 Complete assigned exercises by using drafting machine. C.2 Complete an assignment on drawing various angles.

UNIT III

Geometric Construction

OBJECTIVES:

Use construction techniques for solving problems involving the application of points, lines, planes, and curved or warped surfaces.

1.0.0 Lines

- 1.1.0 Bisecting a line
- 1.2.0 Drawing a straight line parallel to another
- 1.3.0 Dividing a line into equal parts

2.0.0 Angles

- 2.1.0 Bisecting an angle

3.0.0 Circles and Arcs

- 3.1.0 Locating the center of a circle
- 3.2.0 Constructing a circle through given points
- 3.3.0 Drawing a line tangent to a circle through a point on the circle
- 3.4.0 Draw a straight line tangent to two arcs

4.0.0 Polygons

- 4.1.0 Construct an equalateral triangle
- 4.2.0 Construct a square
- 4.3.0 Construct a pentagon
- 4.4.0 Construct a hexagon
- 4.5.0 Construct an octagon

5.0.0 Ellipses

6.0.0 Special curve

- 6.1.0 Hyperbola
- 6.2.0 Spiral

SELECTED STUDENT COMPETENCIES
AND SAMPLE LEARNING ACTIVITIES
FOR

Design/Drafting

UNIT III: Geometric Construction

SELECTED STUDENT COMPETENCIES	SAMPLE LEARNING ACTIVITIES
THE LEARNING ACTIVITIES SHOULD ENABLE THE STUDENT TO:	
A. Draw an ellipse using a compass.	A. Complete an assigned drawing which includes the construction of an ellipse via 4-center method.
B. Construct a square, pentagon, and a hexagon.	B. Complete an assigned exercise containing the construction of a square, pentagon, and hexagon.
C. Draw a line tangent to a circle.	C.1 Complete an assigned drawing containing the drawing of a line tangent to a given circle.
	C.2 Draw an external tangent arc to two given arcs.
	C.3 Draw an internal tangent arc to two given arcs.
	C.4 Draw an ogee curve between two given lines.
	C.5 Draw a complete pattern with a provided sketch. (The sketch has all the dimensions.)

UNIT IV

Orthographic Projection

OBJECTIVES:

To identify and draw the three principle orthographic views of an object.

1.0.0 Definition

2.0.0 Number of Views

- 2.1.0 6 sides
- 2.2.0 3 sides

3.0.0 Most Common Combination of Views

4.0.0 Arrangement of Views

- 4.1.0 Glass box

5.0.0 Angles of Projection

- 5.1.0 First angle
- 5.2.0 Third angle

6.0.0 Hidden Lines

7.0.0 Center Lines

- 7.1.0 Primary
- 7.2.0 Secondary

8.0.0 Curved Surfaces

- 8.1.0 Arcs
- 8.2.0 Cylinders

SELECTED STUDENT COMPETENCIES
AND SAMPLE LEARNING ACTIVITIES
FOR

Design/Drafting

UNIT IV: Orthographic Projection

SELECTED STUDENT COMPETENCIES	SAMPLE LEARNING ACTIVITIES
THE LEARNING ACTIVITIES SHOULD ENABLE THE STUDENT TO:	
A. Identify the three principle views of an orthographic.	A.1 List the three most common views.
	A.2 Construct an orthographic drawing using the three basic views.
B. Describe the accepted position of the three views.	B.1 Complete a drawing having the views in their proper sequence.
C. Identify the six views of a complete orthographic drawing of an object.	C.1 List the six orthographic views.
	C.2 Complete a drawing showing the six views in their proper placement.
D. Produce a complete multiview drawing in a proper manner.	D.1 Make a multiview drawing from a given pictorial sketch on drawing of a product part.
	D.2 Measure a provided object and make a complete multi-view projection with a proper scale. (No need to dimension on the drawing.)

UNIT V

Dimensioning (English and SI Metric)

OBJECTIVES:

This unit is meant to provide the student with the necessary information to accurately and precisely describe a given object.

1.0.0 Definition of Terms

2.0.0 Dimensioning Systems

2.1.0 Decimal-inch

2.2.0 SI metric

2.3.0 Dual dimensioning system

3.0.0 Limits and Tollerances

3.1.0 Methods

4.0.0 Designating Dimensions

4.1.0 Use of dimension lines

4.2.0 Arrow heads

4.3.0 Units of measure

4.4.0 Use of extension lines

4.5.0 Use of leader lines

5.0.0 Placement of Dimensions

5.1.0 Reading direction of dimension

5.1.1 Unidirectional
5.1.2 Aligned

5.2.0 Overall dimensions

5.3.0 Location on views

5.4.0 Dimensions from datums

UNIT V

6.0.0 Dimensioning Special Features

- 6.1.0 Diameters
- 6.2.0 Radius of arcs
- 6.3.0 Rounded ends
- 6.4.0 Curves
- 6.5.0 Dimensioning and locating holes
- 6.6.0 Dimensioning keyseats and knurles
- 6.7.0 Dimensioning tapers

7.0.0 General Notes

- 7.1.0 Use of abbreviations

8.0.0 Designating Machined Surfaces

- 8.1.0 Controlled surfaces
- 8.2.0 Non-controlled surfaces

9.0.0 Do's and Don'ts

SELECTED STUDENT COMPETENCIES
AND SAMPLE LEARNING ACTIVITIES
FOR

Design/Drafting

UNIT V: Dimensioning (English and SI Metric)

SELECTED STUDENT COMPETENCIES	SAMPLE LEARNING ACTIVITIES
THE LEARNING ACTIVITIES SHOULD ENABLE THE STUDENT TO:	
A. Identify the three dimensioning systems used.	A.1 List the three systems. A.2 Show examples of each.
B. Identify the two systems of reading dimensions.	B.1 List the two systems. B.2 Show examples of each.
C. Dimension such special features as curves, arcs, and holes.	C.1 Complete an assigned drawing which include dimensioning of curves, arcs, and holes. C.2 Dimension the multiview drawing which was produced from previous unit. (Unit IV, D.2) C.3 Dimension a provided pictorial drawing.

UNIT VI

Pictorials

OBJECTIVES:

This unit is meant to provide the student with the information necessary to recognize and produce assigned pictorial drawings.

1.0.0 Axonometric

- 1.1.0 Isometric
  - 1.1.1 By the box method
  - 1.1.2 Non-isometric lines
  - 1.1.3 Angles in isometric
  - 1.1.4 Circles and arcs in isometric
  - 1.1.5 Sections
- 1.2.0 Dimetric
- 1.3.0 Trimetric

2.0.0 Oblique

- 1.1.0 Types
  - 1.1.1 Cavalier
  - 1.1.2 Cabinet
  - 1.1.3 General oblique
- 1.2.0 Positions (centering)
- 1.3.0 Circles and arcs in oblique

3.0.0 Perspective

- 3.1.0 Types
  - 3.1.1 1-point (paralled)
  - 3.1.2 2-point (angular)
  - 3.1.3 3-point (oblique)
- 3.2.0 Location of picture plane
- 3.3.0 Location of station point
- 3.4.0 Circles and arcs in perspective

UNIT VI

4.0.0 Exploded Drawings

5.0.0 Phantom Drawings

6.0.0 Shading

- 6.1.0 Location of shaded area
- 6.2.0 Line shading
- 6.3.0 Stippling
- 6.4.0 Smudge shading

SELECTED STUDENT COMPETENCIES
AND SAMPLE LEARNING ACTIVITIES
FOR

Design/Drafting

UNIT VI: Pictorials

SELECTED STUDENT COMPETENCIES	SAMPLE LEARNING ACTIVITIES
THE LEARNING ACTIVITIES SHOULD ENABLE THE STUDENT TO:	
A. Identify and draw an isometric of an object.	A.1 Define an isometric drawing. A.2 Complete an isometric drawing of an object.
B. Identify and draw an oblique of an object.	B.1 Define an oblique drawing. B.2 Complete an assigned oblique drawing of an object.
C. Identify and draw a perspective of an object.	C.1 Define a perspective drawing. C.2 Complete an assigned perspective of an object.
D. Produce an isometric drawing from an orthographic projection.	D.1 Draw a complete isometric presentation with all dimensions from a provided multiview projection.

UNIT VII

Sections and Conventions

OBJECTIVES:

This unit is meant to provide the student with information about sections and when to use them.

1.0.0 Definition

2.0.0 Types of Sections

- 2.1.0 Full
- 2.2.0 Half
- 2.3.0 Offset
- 2.4.0 Broken-out
- 2.5.0 Revolved
- 2.6.0 Removed
- 2.7.0 Auxiliary
- 2.8.0 Thin

3.0.0 Lining and Symbols

4.0.0 Identification of Cutting Plane

5.0.0 When Sections are Used

- 5.1.0 To show detail
- 5.2.0 To show inside of object

SELECTED STUDENT COMPETENCIES
AND SAMPLE LEARNING ACTIVITIES
FOR

Design/Drafting

UNIT VII: Sections and Conventions

SELECTED STUDENT COMPETENCIES	SAMPLE LEARNING ACTIVITIES
THE LEARNING ACTIVITIES SHOULD ENABLE THE STUDENT TO:	
A. Identify the types of sections.	A.1 List the types of sections.
	A.2 Show examples of each.
	A.3 List where the types of sections would be used.
B. Identify various methods of lining as used in drawings of sections.	B.1 Show examples of types of lining.
C. Present a complete drawing with necessary sectioning views included.	C.1 Draw the necessary views, including appropriate sections of a provided pictorial sketch. (Dimensioning is required.)
	C.2 Draw the necessary views, including appropriate sections of a provided object. (Use proper instrument to measure the object obtaining all dimensions.)

UNIT VIII

Auxiliary Views

OBJECTIVES:

This unit is meant to provide the student with the information to allow him/her to construct an auxiliary view for a given object.

1.0.0 Definition

2.0.0 Types of Primary Auxiliary Views

- 2.1.0 Top
- 2.2.0 Front
- 2.3.0 Right side

3.0.0 Relationship of Auxiliary View to the Regular Orthographic View

4.0.0 Curves and Arcs in an Auxiliary View

5.0.0 Symmetry in Auxiliary Views

- 5.1.0 Symmetrical
- 5.2.0 Non-symmetrical

6.0.0 Partial Auxiliary Views

7.0.0 Secondary Auxiliary Views

SELECTED STUDENT COMPETENCIES
AND SAMPLE LEARNING ACTIVITIES
FOR

Design/Drafting

UNIT VIII: Auxiliary Views

SELECTED STUDENT COMPETENCIES	SAMPLE LEARNING ACTIVITIES
THE LEARNING ACTIVITIES SHOULD ENABLE THE STUDENT TO:	
A. Identify an auxiliary view of an object.	A.1 List the types of auxiliary views. A.2 Complete an assigned drawing containing an auxiliary view of an object.
B. Determine when to use an auxiliary view, and what type to use under a certain situation.	B.1 Prepare the necessary principle and auxiliary views of a provided object (show dimensions).
C. Present a secondary auxiliary view drawing.	C.1 Prepare the necessary views including a secondary auxiliary view of a provided sketch (show dimensions).

UNIT IX

Working Drawings

OBJECTIVES:

This unit is meant to provide the student with the information necessary to assemble a set of working drawings of a product.

1.0.0 Definition

2.0.0 Detail Drawings

- 2.1.0 For parts of same shape but different size
- 2.2.0 For detail of parts

3.0.0 Choice of Scale

4.0.0 List of Materials

- 4.1.0 What is necessary
- 4.2.0 Where to place it

5.0.0 Notes and Specifications

- 5.1.0 What is contained in notes and specifications
- 5.2.0 Where to place on drawing

6.0.0 Checking Drawing

SELECTED STUDENT COMPETENCIES
AND SAMPLE LEARNING ACTIVITIES
FOR

Design/Drafting

UNIT IX: Working Drawings

SELECTED STUDENT COMPETENCIES	SAMPLE LEARNING ACTIVITIES
THE LEARNING ACTIVITIES SHOULD ENABLE THE STUDENT TO:	
A. Define a detail drawing.	A.1 Give the definition of a detail drawing. A.2 Complete a drawing which includes the use of details.
B. Produce a complete production drawing.	B.1 Design a simple commercial product and prepare a complete production drawing for it.

UNIT X

Charts and Graphs

OBJECTIVES:

This unit is meant to provide the student with the information necessary to produce a chart or a graph, and the knowledge to select the most appropriate type for his/her data presentation.

1.0.0 Definition

2.0.0 Types of Charts and Graphs

- 2.1.0 Percentage bar chart
- 2.2.0 Organization chart
- 2.3.0 Bar chart
- 2.4.0 Pie chart
- 2.5.0 Pictorial chart
- 2.6.0 Flow chart
- 2.7.0 Rectangular coordinate graph
- 2.8.0 Simi-logarithmic graph
- 2.9.0 Logarithmic graph
- 2.10.0 Polar coordinate graph

3.0.0 Elements of Charts and Graphs

SELECTED STUDENT COMPETENCIES
AND SAMPLE LEARNING ACTIVITIES
FOR

Design/Drafting

UNIT X: Charts and Graphs

SELECTED STUDENT COMPETENCIES	SAMPLE LEARNING ACTIVITIES
THE LEARNING ACTIVITIES SHOULD ENABLE THE STUDENT TO:	
A. Identify 4 types of charts or graphs, and their applications.	A.1 List 4 of the 6 given types of charts.
B. Draw a bar, pie, and a line chart.	B.1 Draw a proper type of charts to present a given set of data. B.2 Draw a proper type of graph to present a multi-dependent variable data.

UNIT XI

Specialized Drafting

OBJECTIVES:

This unit is meant to provide the student with information regarding specialized areas within drafting.

1.0.0 Construction Drafting

- 1.1.0 Basic drawings
- 1.2.0 Dimensioning techniques
- 1.3.0 Scales and dimensioning relationships
- 1.4.0 Materials design and detail
- 1.5.0 Symbols

2.0.0 Electrical Drafting

- 2.1.0 Basic circuits
- 2.2.0 Graphic symbols
- 2.3.0 Basic electrical units
- 2.4.0 Electrical diagrams
- 2.5.0 Printed circuit diagrams

3.0.0 Topographical Drafting

- 3.1.0 Types of maps
- 3.2.0 Symbols
- 3.3.0 Scales used on maps

SELECTED STUDENT COMPETENCIES
AND SAMPLE LEARNING ACTIVITIES
FOR

Design/Drafting

UNIT XI: Specialized Drafting

SELECTED STUDENT COMPETENCIES	SAMPLE LEARNING ACTIVITIES
THE LEARNING ACTIVITIES SHOULD ENABLE THE STUDENT TO:	
A. Identify the types of specialized drafting areas.	A.1 List 3 types of specialized drawings. A.2 Complete assigned drawings in each of these areas. A.3 Field trip to one or more (if possible) businesses involved with the specialized areas.

UNIT XI

Reproduction Processes

OBJECTIVES:

This unit is meant to provide the student with information regarding the reproduction of drawings.

1.0.0 The Diazo Process

- 1.1.0 Dry white prints
- 1.2.0 Dry sepia prints
- 1.3.0 Wet white prints
- 1.4.0 Wet sepia prints

2.0.0 The Silver Process

3.0.0 The Electrostatic Process

SELECTED STUDENT COMPETENCIES
AND SAMPLE LEARNING ACTIVITIES
FOR

Design/Drafting

UNIT XII: Reproduction Processes

SELECTED STUDENT COMPETENCIES	SAMPLE LEARNING ACTIVITIES
THE LEARNING ACTIVITIES SHOULD ENABLE THE STUDENT TO:	
A. Identify types of reproduction processes.	A.1 List the 3 major types of reproduction processes. A.2 Field trip (if possible) to a business that uses one or more of these processes.
B. Reproduce copies from original drawings.	B.1 Make diazo prints from previous produced drawings. B.2 Make a sepia intermediate from the floor plan original which was drawn in Unit XI. B.3 Make a color transparency via the white printer: (special diazo material is needed).

UNIT XIII

Techniques of Design

OBJECTIVES:

This unit is meant to provide the student with information regarding design principles and elements.

1.0.0 Elements of Design

- 1.1.0 Lines
- 1.2.0 Planes and solids
- 1.3.0 Surface quality

2.0.0 Principles of Design

- 2.1.0 Unity and variety
- 2.2.0 Balance and symmetry
- 2.3.0 Proportion
- 2.4.0 Rhythm

3.0.0 Product Design Processes

- 3.1.0 Visualization
- 3.2.0 Model study
- 3.3.0 Rendering

4.0.0 Fabrication Design Processes

- 4.1.0 Design of welds
- 4.2.0 Casting design
- 4.3.0 Forging design
- 4.4.0 Stamping design

5.0.0 Strength of Materials

- 5.1.0 Mechanical properties
- 5.2.0 Simple stress
- 5.3.0 Strain
- 5.4.0 Safety factor

SELECTED STUDENT COMPETENCIES
AND SAMPLE LEARNING ACTIVITIES
FOR

Design/Drafting

UNIT XIII: Techniques of Design

SELECTED STUDENT COMPETENCIES	SAMPLE LEARNING ACTIVITIES
THE LEARNING ACTIVITIES SHOULD ENABLE THE STUDENT TO:	
A. Identify the principles of design.	A.1 List the 4 principles of design. A.2 Examine examples of both good and poor design.
B. Apply the design principles and considerations to design a product.	B.1 Design a product and prepare a complete drawing and technique document set for production and sales.

UNIT XIV

Threads and Fasteners

OBJECTIVES:

This unit is meant to provide the student with information regarding threads and fasteners.

1.0.0 Threads

- 1.1.0 Terms
- 1.2.0 Profiles
- 1.3.0 Standards
- 1.4.0 Representation
- 1.5.0 Dimensioning

2.0.0 Mechanical Fasteners

- 2.1.0 Threaded fasteners
- 2.2.0 Non-threaded fasteners

SELECTED STUDENT COMPETENCIES
AND SAMPLE LEARNING ACTIVITIES
FOR

Design/Drafting

UNIT XIV: Threads and Fasteners

SELECTED STUDENT COMPETENCIES	SAMPLE LEARNING ACTIVITIES
THE LEARNING ACTIVITIES SHOULD ENABLE THE STUDENT TO:	
A. Identify several of the fasteners used.	A.1 List 6 types of fasteners and give advantages and disadvantages of each.
B. Present different types of fasteners in various technical forms.	B.1 Complete an assigned drawing constructing several fasteners.

UNIT XV

Revolutions

OBJECTIVES:

This unit is meant to provide the student with information regarding revolutions and their use.

1.0.0 Definition of Revolutions

2.0.0 Rules of Revolutions

- 2.1.0 View perpendicular to axis is unchanged
- 2.2.0 Distances parallel to axis are true

3.0.0 Revolutions About on Axis

- 3.1.0 Horizontal axis
- 3.2.0 Vertical axis

4.0.0 Practical Revolved Views

SELECTED STUDENT COMPETENCIES
AND SAMPLE LEARNING ACTIVITIES
FOR

Design/Drafting

UNIT XV: Revolutions

SELECTED STUDENT COMPETENCIES	SAMPLE LEARNING ACTIVITIES
THE LEARNING ACTIVITIES SHOULD ENABLE THE STUDENT TO:	
A. Identify why revolutions are used.	A.1 List the instances where a revolution would be used. A.2 List the three types of simple revolution methods, and illustrate the drawing procedures.
B. Draw a revolution.	B.1 Complete an assigned drawing containing a revolution.

UNIT XVI

Intersections and Developments

OBJECTIVES:

This unit is meant to provide the student with information regarding intersections and developments.

1.0.0 Intersections

- 1.1.0 Intersecting prisms
- 1.2.0 Intersecting cyclinders
- 1.3.0 Intersecting cylinders and prisms
- 1.4.0 Intersecting cylinders and cones
- 1.5.0 Intersecting of planes and curved surfaces

2.0.0 Developments

- 2.1.0 Parallel line developments
- 2.2.0 Radial line developments
- 2.3.0 Triangulation
- 2.4.0 Rollout developments

SELECTED STUDENT COMPETENCIES
AND SAMPLE LEARNING ACTIVITIES
FOR

Design/Drafting

UNIT XVI: Intersections and Developments

SELECTED STUDENT COMPETENCIES	SAMPLE LEARNING ACTIVITIES
THE LEARNING ACTIVITIES SHOULD ENABLE THE STUDENT TO:	
A. Identify types of developments.	A.1 List types of development.
B. Develop a pattern for a cone.	B.1 Complete an assigned drawing of a cone development.
C. Develop and draw a transition piece.	C.1 Make transition pieces out of paper and put them together with rubber cement.
	C.2 Draw some examples of transition pieces.
D. Draw intersections of right prisms and intersections of right cylinders.	D.1 Visit a pattern development shop.
	D.2 Sketch out an intersection of a right cylinder and list the steps involved.

UNIT XVII

Technical Illustrations

OBJECTIVES:

This unit is meant to provide the student with information regarding technical illustrations.

1.0.0 Pictorials

- 1.1.0 Axonometric
- 1.2.0 Oblique
- 1.3.0 Perspective
- 1.4.0 Expanded drawings
- 1.5.0 Phantom drawings
- 1.6.0 Shading

2.0.0 Freehand Drawing

- 2.1.0 Basic essentials
- 2.2.0 Sketching straight lines
- 2.3.0 Sketching curved lines
- 2.4.0 Multi-view sketches
- 2.5.0 Pictorial sketches

3.0.0 Patent Drawings

- 3.1.0 Patents, copyrights, and trademarks
- 3.2.0 Patent representatives
- 3.3.0 Drawing standards
- 3.4.0 Views required
- 3.5.0 Transmission of drawings

UNIT XVII

4.0.0 Inking, Shading, and Rendering

- 4.1.0 Inking techniques
- 4.2.0 Lighting
- 4.3.0 Shading
- 4.4.0 Coloring
- 4.5.0 Air brushing

5.0.0 Illustrating for Sales

- 5.1.0 Layout and advertising
- 5.2.0 Visualizing the end product
- 5.3.0 Advertising and sales brochures

SELECTED STUDENT COMPETENCIES
AND SAMPLE LEARNING ACTIVITIES
FOR

Design/Drafting

UNIT XVII: Technical Illustration

SELECTED STUDENT COMPETENCIES	SAMPLE LEARNING ACTIVITIES
THE LEARNING ACTIVITIES SHOULD ENABLE THE STUDENT TO:	
A. Identify the needs and the uses of technical illustrations.	A.1 Write a short report to describe when, where a technical illustration is used.
	A.2 Collect a sample technical illustration piece and critique it.
B. Produce a complete set of technical illustration documents.	B.1 Make a technical illustration for a commercial product. (Start from thumbnail sketch to finished ink drawing).
	B.2 Write advertising materials and plan a promotion brochure

UNIT XVIII

Cams and Gears

OBJECTIVES:

This unit is meant to provide the student with information regarding cams and gears.

1.0.0 Cams

- 1.1.0 Function of cams
- 1.2.0 Terms
- 1.3.0 Motion diagrams
- 1.4.0 Plate-cam profiles
- 1.5.0 Cylindrical cam development

2.0.0 Gears

- 2.1.0 Functions of gears
- 2.2.0 Terms
- 2.3.0 Types of gears
- 2.4.0 Gear formulas
- 2.5.0 Gear drawings

SELECTED STUDENT COMPETENCIES
AND SAMPLE LEARNING ACTIVITIES
FOR

Design/Drafting

UNIT XVIII: Cams and Gears

SELECTED STUDENT COMPETENCIES	SAMPLE LEARNING ACTIVITIES
THE LEARNING ACTIVITIES SHOULD ENABLE THE STUDENT TO:	
A. Identify the parts of a gear.	A.1 List the major parts of a gear.
	A.2 Complete an assigned drawing of a gear.
B. Describe the different types of gears and their functions.	B.1 List the major types of gears and give a brief description for each.
C. Describe the different types of cams and cam followers and their uses.	C.1 List the major types of cam followers and give a brief description for each.
	C.2 Construct a displacement diagram and a complete detail drawing from given information of a cam design.

UNIT XIX

Technical Documents Control Systems

OBJECTIVES:

This unit is meant to provide the student with information about the storage and handling of drawings.

1.0.0 Care, and Handling of Drawings

- 1.1.0 Originals
- 1.2.0 Prints

2.0.0 File Systems

- 2.1.0 Vertical
- 2.2.0 Horizontal
- 2.3.0 Folding of prints

3.0.0 Micro Film

- 3.1.0 Aperture cards
- 3.2.0 Micro film
- 3.3.0 Reader - printers

SELECTED STUDENT COMPETENCIES
AND SAMPLE LEARNING ACTIVITIES
FOR

Design/Drafting

UNIT XIX: Technical Documents Control Systems

SELECTED STUDENT COMPETENCIES	SAMPLE LEARNING ACTIVITIES
THE LEARNING ACTIVITIES SHOULD ENABLE THE STUDENT TO:	
A. Identify the types of control systems.	A.1 List the types of control systems. A.2 A possible field trip to an engineering firm and see its document control system.
B. Produce aperture cards for the technical documents and the control operation.	B.1 Use existing photographic equipment to produce 35mm aperture cards from those technical documents made in the semester.

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